SMART ASSISTANCE FOR VISUALLY CHALLENGED PEOPLE

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ABSTRACT

In order to help blind people navigate safely and quickly this system is proposed. It includes two sections, one is obstacle detection and another one is detecting user's current location. The Ultrasonic sensor is embedded on the stick which is used for detecting the obstacles in front of them while moving. When the obstacle is detected, the user will be aware of getting the sound from the buzzer. The GPS module is interfaced with Arduino device used to find the GPS coordinates. The GSM module is also interfaced to send these coordinates to the caretaker's mobile phone via SMS. The location of the blind people is detected using these coordinates. This overall process is done through Arduino device.

KEYWORDS: Ultrasonic sensor, Arduino, GPS, GSM, Blind Stick

I.INTRODUCTION

Blind mobility is one of the main challenges encountered by visually impaired persons in their daily lives. The blind people lives and activities are greatly restricted by the loss of eyesight. They can only walk on fixed routes that are significant in their lives, with blind navigation equipment and the accumulated memories in their long-term exploration. There are approximately 37 million blind people across the world over 15 million are from India. Many disabled people prefer to do things independently rather than depend on others. The smart assistance system for blind people can provide the solution to this problem. The main objective of the project is to develop a reliable, user-friendly and robust solution for smooth navigation. The first part of the paper provides information about Ultrasonic sensor. There are methods to calculate the distance of obstacle. One of the methods is by using an ultrasonic sensor HC-SR04. This sensor has two openings. One is for transmitting the ultrasonic waves and another one is for receiving waves which are reflecting back as echo signals. This range is from 2cm to 400 cm. Thus the obstacle detection is done by using sensor and Arduino device. The second part, of this paper, is detecting blind's people current location. It itself includes two part that is finding the GPS coordinates using GPS module kit and sending user's current location via SMS using GSM module. The GPS module finds the position of the earth surface where it is situated. It calculates the current position in terms of Latitude and Longitude. In this project, the data regarding the geographical coordinate is extracted from the GPS output with the help of the Arduino. Then, The GSM module is interfacing with Arduino device to Read the GPS coordinates from GPS module and send those coordinates via SMS to the mobile phone. Generally GSM network consists of two components and they are Mobile Station and Base Station Subsystem. There are varieties of GSM module like SIM300, SIM800, SIM900, etc. Here we use SIM900 GSM module which is a dual band GSM/GPRS Sim900 MHz module. There is a SIM card available in GSM module through which we can send and receive messages. Here the communication between GSM module and Arduino is serial. Thus the location of the blind people is sent as SMS to their caretaker using GSM module.

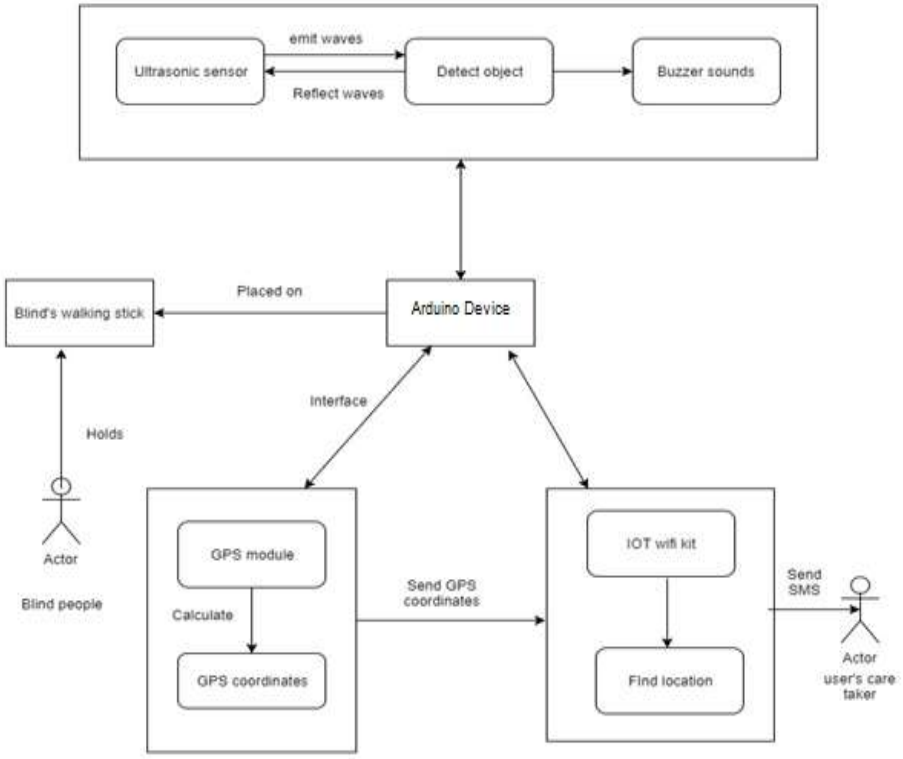

FIG 1: ARCHITECTURE DIAGRAM

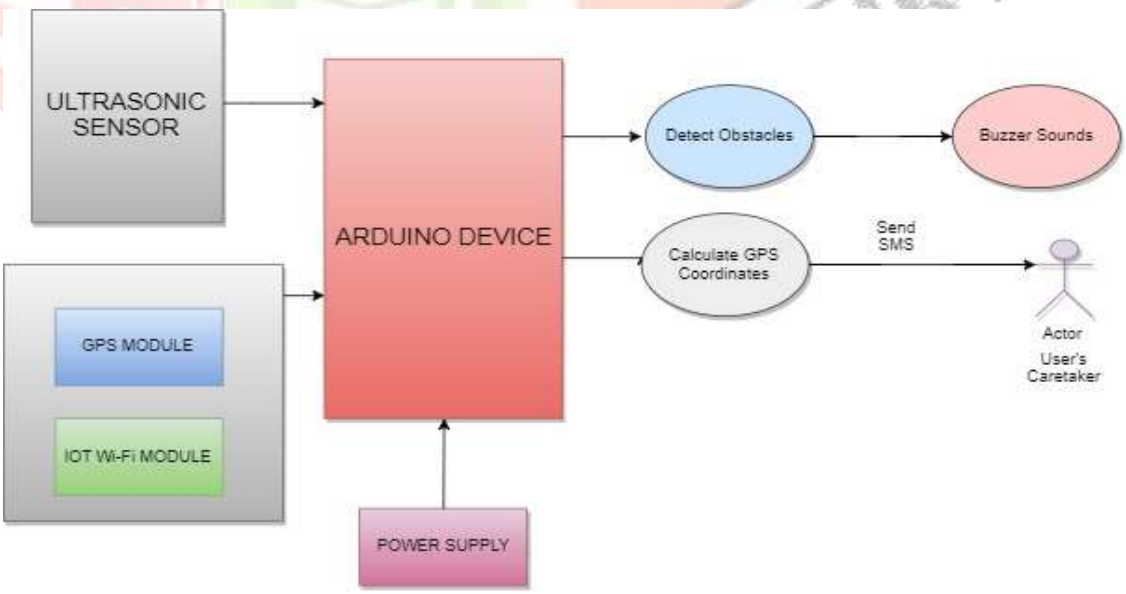

FIG 2: BLOCK DIAGRAM

II.SIGNIFICANCE

1. This project is useful for visually challenged people to navigate easily outdoor by aware of obstacles.
2. Also, user's caretaker can be able to know the user's current location whenever they want.

III. COMPONENTS and REQUIREMENTS

ARDUINO UNO

FIG 3: ARDUINO UNO

Arduino is a programmable circuit's board which we can write a program based on your projects. Arduino program will be uploading with IDE (Integrated Development Environment) software that runs on your computer, it is used to write and upload computer code to the Arduino physical board. Arduino language is merely a set of C/C++ functions that can be called from your code.

ULTRASONIC SENSOR

The Ultrasonic Sensors belongs to a category of sensors that emits ultrasound i.e. sound of frequency more than 20 kHz [10]. Initially, a trigger pulse is given as an input to the ultrasonic sensor using ARDUINO. The ultrasonic sensor then emits a short 40 kHz ultrasonic burst signal. This burst signal travels through the air at approximately 343ms-1, hits an object and then bounces back to the sensor resulting in an output pulse [9]. This output pulse is captured by ARDUINO. Then using the time taken by the pulse to return back and we calculate the distance from the obstacle.

The sensor consists of four pins:

- VCC - It is used to provide 5V power to the sensor.
- Trig – Takes in Input Pulse to trigger the sensor.
- Echo - It is used to receive the Output Pulse i.e. the echo from the object detected.
- Ground (GND) - It connects sensor to the ground.

FIG 4: ULTRASOINC SENSOR

GPS MODULE

The **Global Positioning System** (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth.

GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three-dimensional location (latitude, longitude, and altitude) plus the time.

FIG 5: GPS MODULE

GSM MODULE

An international telecommunications standard for the transmission of voice and data between cell phones and pther mobile devices. GSM is a second generation digital mobile telephone standard using a variation of Time Division Mulitple Access(TDMA). It is the most widely used of the three digital wireless telephone technologies – CDMA(Code Division Muliple Access), GSM and TDMA. GSM digitizes and compresses voice data, then send it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900, 1800 or 1,900MHZ frequency bands.

FIG 6: GSM MODULE

V. MODULE DESCRIPTION

This project includes three parts of the implementation. They are

1. Obstacle detection
2. Calculate GPS coordinates
3. Send location via SMS

MODULE 1 – OBSTACLE DETECTION

An ultrasonic sensor is a device that can measure the distance to an object using sound waves. It measures the distance by sending out a sound wave at a specific frequency listing for the sound wave to reflect back.

CONNECTION BETWEEN ULTRASONIC SENSOR AND ARDUINO

- VCC -> Arduino +5V pin
- GND -> Arduino GND pin

- TRIG -> Arduino Digital pin 9
- ECHO -> Arduino Digital pin 10

FIG 7: ULTRASOINC SENSOR CONNECTION WITH ARDUINO

After this setup, the program is developed to measure the distance between the ultrasonic sensor and obstacles and to make the buzzer sounds when the obstacle is detected. Then the program is loaded to the Arduino software. As per the specified range in the program, the distance is calculated and the Buzzer is activated.

HARDWARE CONNECTION FOR OBSTACLE DETECTION

FIG 8: CONNECTION FOR ULTRASONIC SENSOR

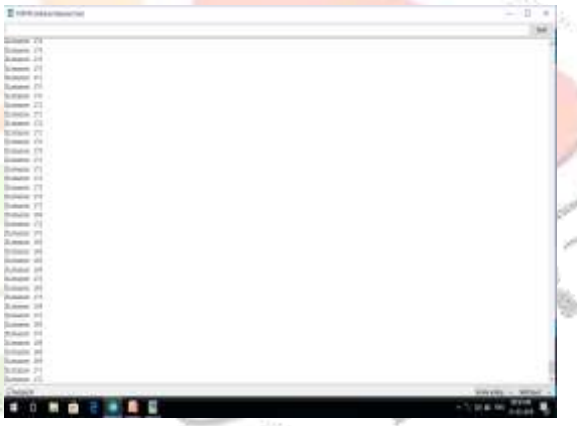

FIG 9: OUTPUT FOR OBSTACLE DETECTION

MODULE 2 – CALCULATE GPS COORDINATES

GPS module uses a group of satellites and ground station to compute position and time almost anywhere on the earth. With this information and some math, a GPS module can calculate its position and time. Here, GPS module is interfaced with Arduino device to calculate the GPS coordinates such as latitude and longitude.

HARDWARE CONNECTION BETWEEN GPS MODULE AND ARDUINO DEVICE

- GPS VCC -> Arduino +3.3V pin
- GPS GND -> Arduino GND pin
- GPS TX -> Arduino Digital pin 4

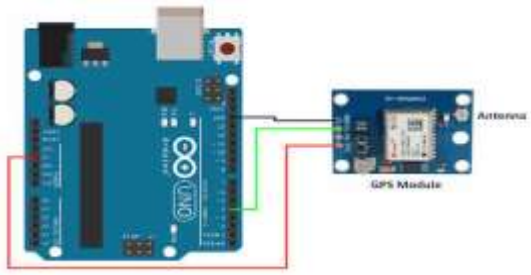

FIG 10: CONNECTION SETUP FOR GPS MODULE

SOFTWARE SETUP

- Put the 'TINYGPS library' inside the Arduino's libraries folder.

Then the program is loaded to the Arduino software and serial monitor window is opened. The GPS coordinates values are displayed by getting values from the GPS module.

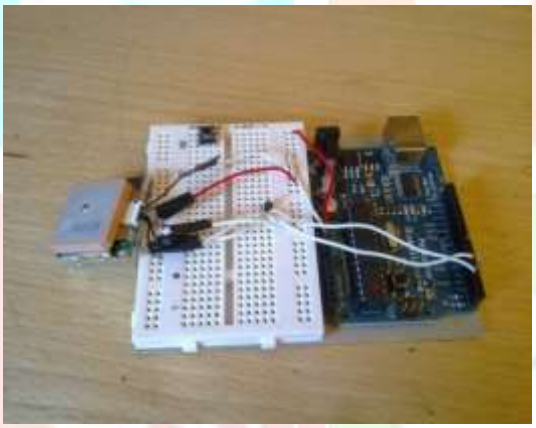

FIG 11: GPS CONNECTION WITH ARDUINO

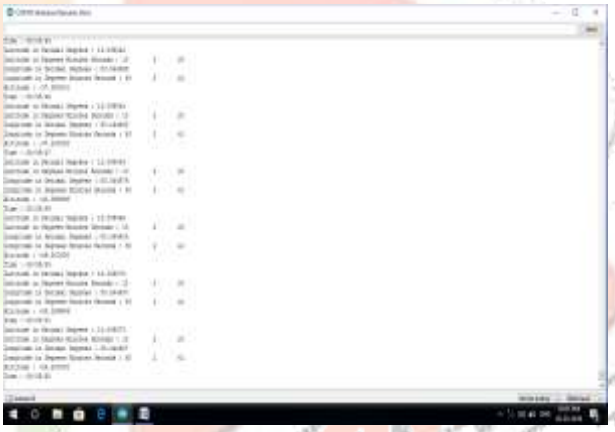

FIG 12: OUTPUT FOR GPS MODULE

5.3 SEND COORDINATES VIA SMS

The GSM SIM900 is used to implement this module. The GSM module is interfaced with the Arduino device. It reads the data (GPS coordinates) from GPS module and sends those coordinates to mobile phone via SMS using SIM card enabled in GSM module. Then the location of the user is detected easily using the data that has been sent in SMS using google map.

HARDWARE CONNECTION BETWEEN GSM MODULE AND ARDUINO DEVICE

- GSM VCC -> Arduino +5V pin
- GSM GND -> Arduino GND pin
- GSM TX -> Arduino RX
- GSM RX -> Arduino TX

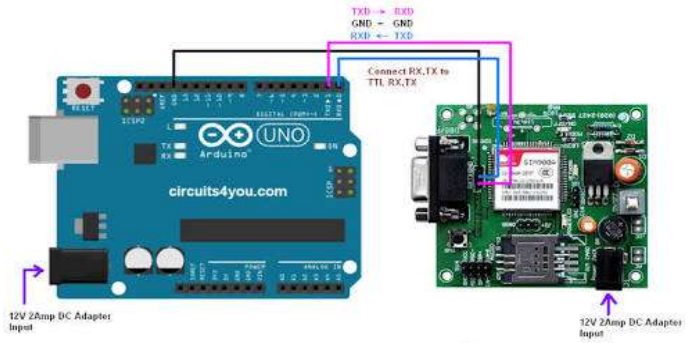

FIG 13: CONNECTION SETUP FOR GSM MODULE

VII. FUTURE EXPANSION

We have helped the visually challenged people to move easily outdoor and send his/her current location. We would like to help them to reach their desired destination by guiding them through telling routes, but this is infeasible within the allotted timeframe. We have several concepts regarding how it can be implemented and to make blind people use easily. In future, this module can be designed by integrating google map.

VII. CONCLUSION

The main objective of this project is to assist visually challenged people to safely move among obstacles and other hurdles faced by them in their daily life. Using this guiding system the blind people can travel in the unknown areas independently. Less training time period is required to use this smart system. The other objective is to make the blind person's caretaker know about the blind person's current location. This will be very helpful in any hard situation. This solution is a user-friendly navigational aid for the visually challenged.

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[8] http://www.arduino.cc

[9] http://github.com